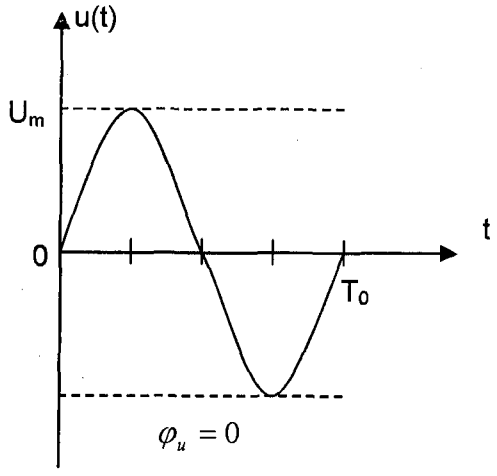
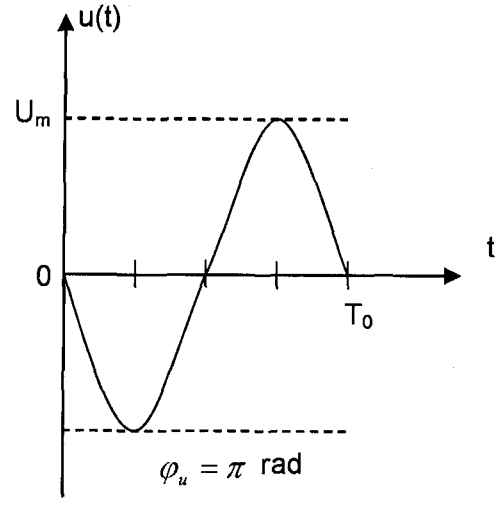
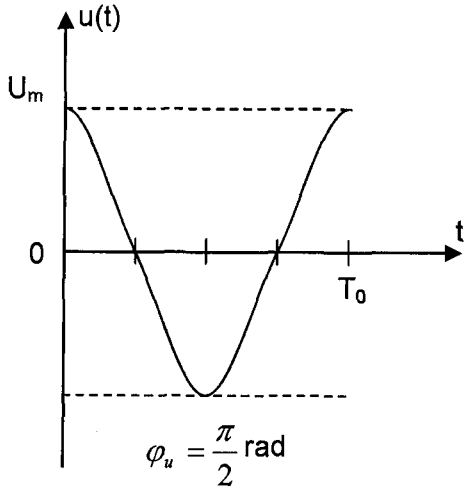
* Pour toute grandeur oscillante u(t) et varie sinusoïdalement au cours du temps $u(t) = U_m \sin(\omega_0 t + \varphi_u)$.



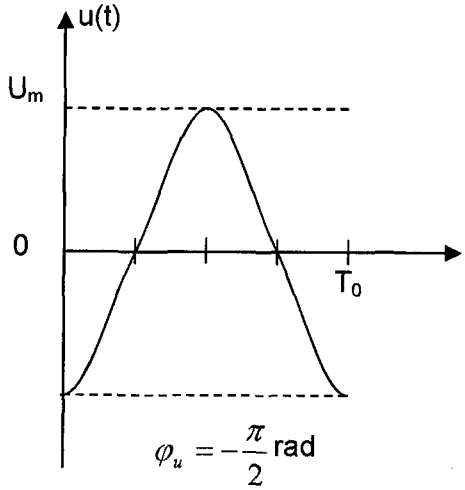
$\varphi_u = 0$



$\varphi_u = \pi$ rad



$\varphi_u = \frac{\pi}{2}$ rad



$\varphi_u = -\frac{\pi}{2}$ rad

* Expression de E_e et E_m en fonction du temps.

$E_e = \frac{1}{2}\frac{q(t)^2}{C}$ or $q(t) = Q_m.\sin(\omega_0 t + \varphi_q)$ alors $E_e = \frac{1}{2}\frac{Q_m^2}{C}\sin^2(\omega_0 t + \varphi_q)$ or

$\sin^2(\omega_0 t + \varphi_q) = \frac{1-\cos(2\omega_0 t + 2\varphi_q)}{2}$ d'où $E_e = \frac{1}{4}\frac{Q_m^2}{C}(1 - \cos(2\omega_0 t + 2\varphi_q))$ or $E_T = \frac{1}{2}\frac{Q_m^2}{C}$ alors

$E_e = \frac{E_T}{2}(1 - \cos(2\omega_0 t + 2\varphi_q))$.

$E_m = \frac{1}{2} L i^2$ or $i(t) = Q_m w_0 \cos(\omega_0 t + \varphi_q)$ alors $E_m = \frac{1}{2} L.Q_m^2 w_0^2 \cos^2(w_0 t + \varphi_q)$ or

$\cos^2(\omega_0 t + \varphi_q) = \frac{1+\cos(2\omega_0 t + 2\varphi_q)}{2}$ et $L w_0^2 = \frac{1}{C}$ d'où $E_m = \frac{1}{4}\frac{Q_m^2}{C}(1 + \cos(2\omega_0 t + 2\varphi_q))$ or $E_T = \frac{1}{2}\frac{Q_m^2}{C}$

alors $E_m = \frac{E_T}{2}(1 + \cos(2\omega_0 t + 2\varphi_q))$.

$E_e(t)$ et $E_m(t)$ sont deux fonctions périodiques de pulsation $\omega = 2\omega_0$ et de période $T = \frac{T_0}{2} = \pi\sqrt{LC}$.